United States Patent

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[54] **AUTOMATIC DAMPER MEANS**
8 Claims, 6 Drawing Figs.

[52] **U.S. Cl.** **126/295,** 110/163, 251/129
[51] **Int. Cl.** **F23l 3/00**
[50] **Field of Search** 431/26; 110/163; 126/292, 295, 297; 251/129

[56] **References Cited**

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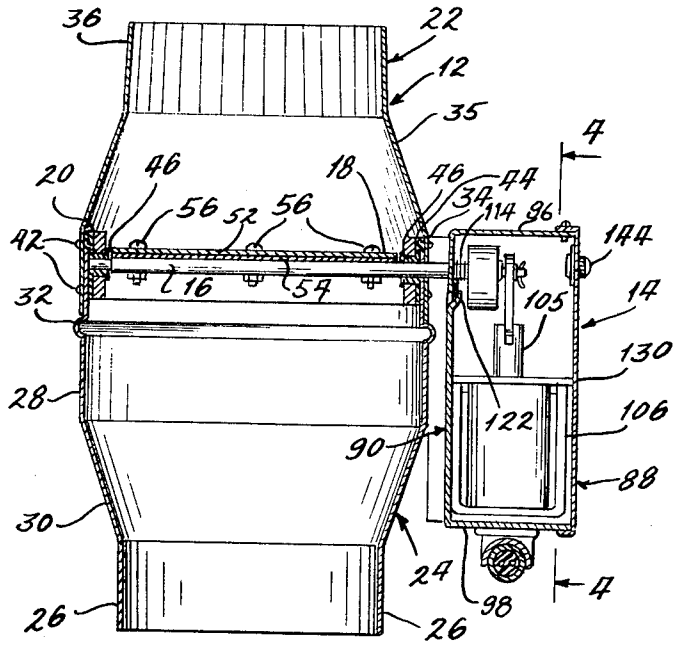
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ABSTRACT: An automatic damper for use in the exhaust flue of combustion devices such as furnaces and the like to prevent undesirable loss of hot or cold air out the flue during periods when no combustion is taking place and to assure that no combustion can take place unless and until the flue is open or unrestricted. The damper has a rotatable damper plate normally biased to a closed position for preventing flow communication through the flue, motor means which when energized move the damper plate to an alternate open position to allow substantially unrestricted communication through the flue, and switch means connected in a circuit with the means that supply fuel to the combustion means, said switch means being closed when the damper plate moves to its open position to enable a combustion cycle to take place.



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2 Sheets-Sheet 1

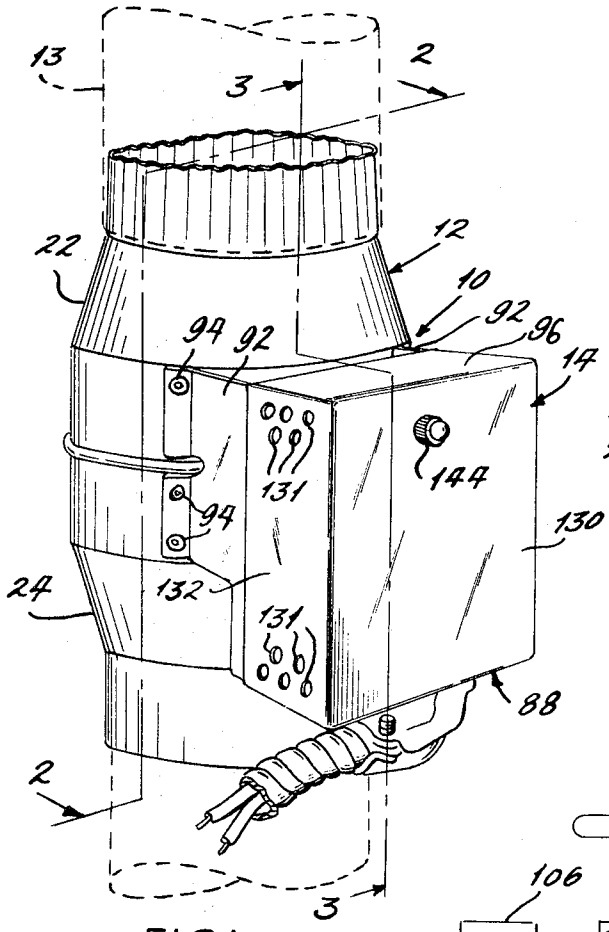


FIG.1

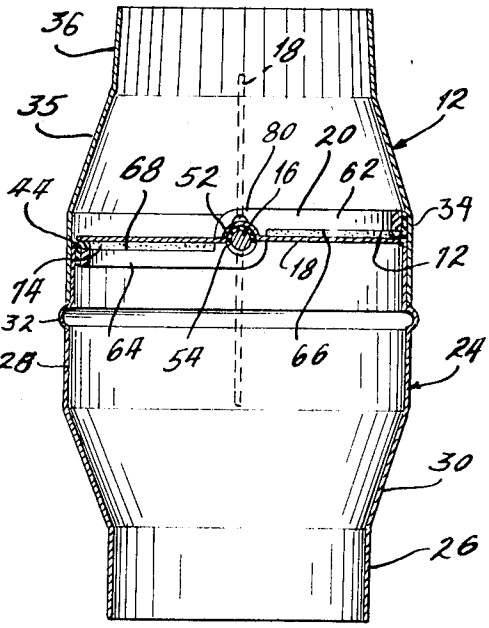


FIG.2

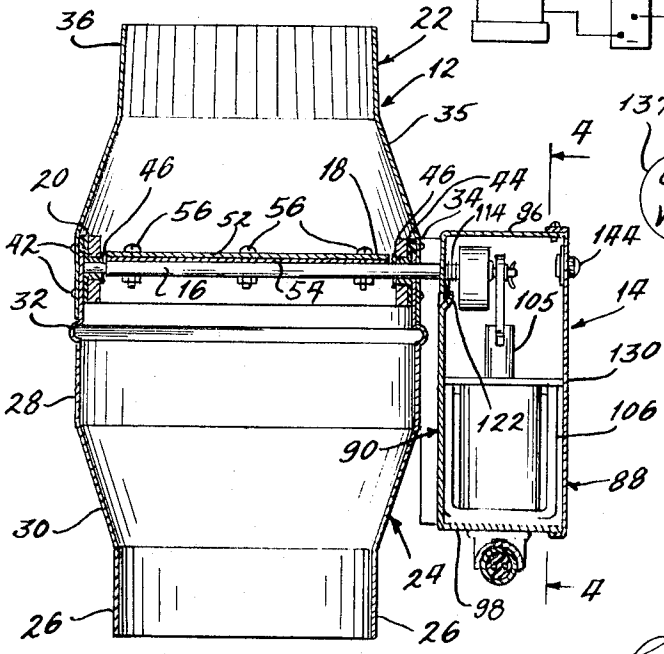


FIG.3

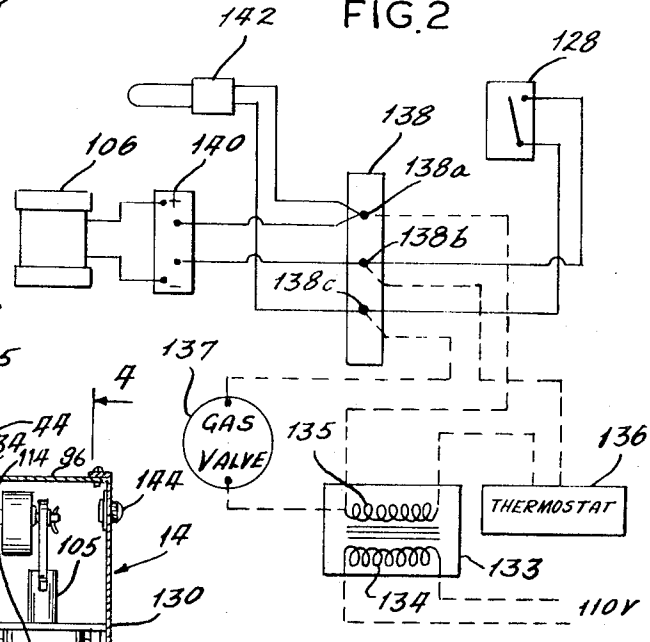


FIG.6

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2 Sheets-Sheet 2

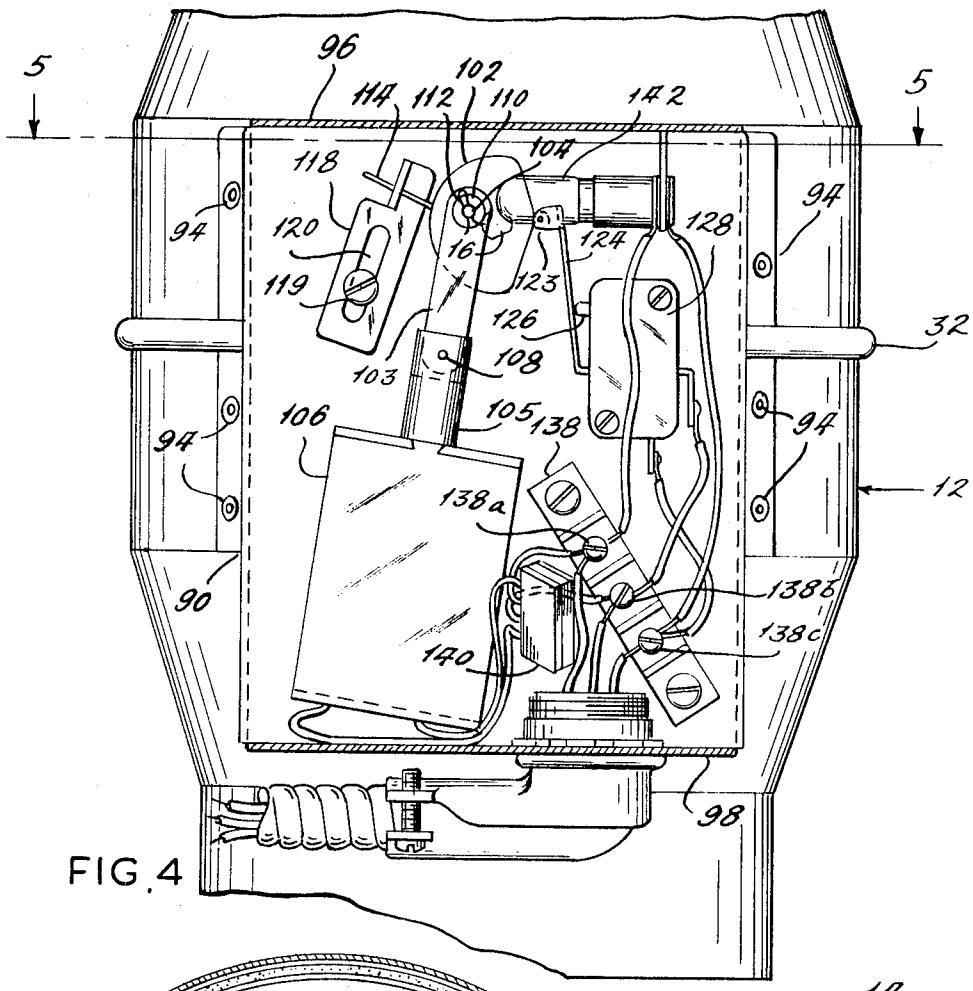


FIG. 4

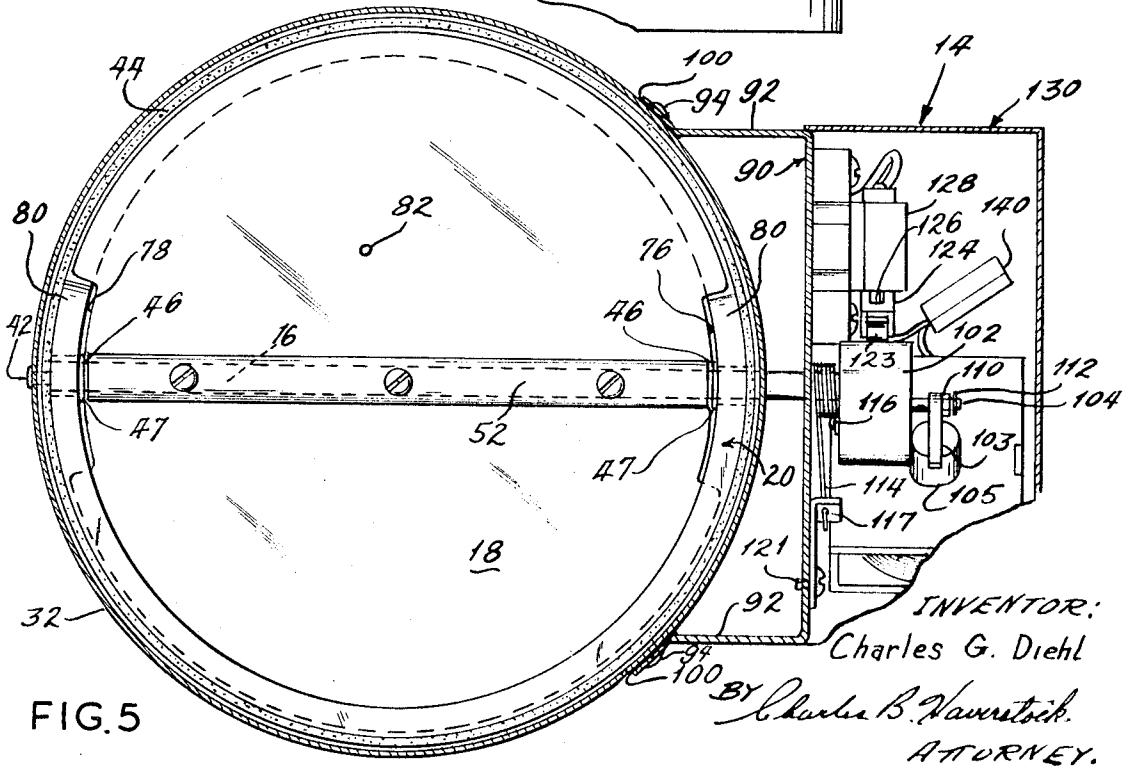


FIG. 5

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AUTOMATIC DAMPER MEANS

Many automatic damper devices are in existence. For the most part, however, the known devices are designed to produce optimum draft conditions and to remain at least partially open at all times even when no combustion is taking place. By remaining open particularly when no combustion is taking place, the known devices permit much of the heat present in the combustion chamber, as well as some of the conditioned room air that surrounds the device, to escape out the flue and this often takes place relatively rapidly due to normal convection currents and vacuum updrafts and results in considerable loss and inefficient operation. This loss of conditioned air means that furnaces, air conditioners and like devices must operate with longer and/or more frequent combustion cycles to generate the desired amount of properly conditioned air and hence the fuel costs and operating costs of such devices are substantially higher than need be.

The subject automatic damper device overcomes these and other shortcomings and disadvantages of the existing devices by providing damper means in an exhaust flue which are open substantially only during actual combustion or exhaust periods to allow for the escape of the products of combustion, smoke, fumes, and odors but otherwise remain closed or substantially closed thereby preventing the undesirable loss of hot or cold air including loss of heated furnace air as well as room conditioned air. By reducing these undesirable losses, the present device substantially reduces heating and air-conditioning costs and this can be done without creating safety hazards such as are common with known vent control devices. The savings and increased efficiencies thus obtained are also obtained with minimum change or modification of existing equipment including existing furnace and air-conditioning equipment.

The subject damper means include a damper plate which is mounted for movement between a closed portion substantially blocking or preventing flow through an exhaust flue and an open position permitting substantially unrestrained flow therethrough. The portion of the subject damper means in which the damper plate is positioned is preferably larger in cross section than the cross section of the flue pipe in which the subject means are installed so that at least as large a flow passage is provided at that location when the damper plate is open as is provided by the flue itself. The damper plate in the present device is normally biased into a closed condition so that when no energizing power is being applied to the subject damper means, the damper plate substantially prevents flow from the combustion chamber out of the flue. It is anticipated that some leakage should be provided, however, so that the pilot light can remain on at all times. Solenoid or like means are operatively connected to the damper plate and when energized, the solenoid means rotate the plate from its normally closed to its open position. The solenoid means are usually energized by the control means for the furnace or other device with which the subject means are being used. When the plate moves to its open position, it causes a normally open switch associated therewith to close and this in turn permits energizing of the fuel control means on the furnace thereby supplying fuel to the furnace which is ignited by the pilot light to produce a combustion cycle. It is to be noted in this regard that a furnace equipped with the subject flue control cannot enter a combustion cycle until the damper plate is open and this is an important safety provision. When the combustion cycle is over, the solenoid means will be deenergized causing the damper plate to return to its closed position under the control of resilient means. In so doing, the switch means will reopen.

In the present device, the damper plate solenoid means are controlled by thermostat means located in the house or other place being heated or cooled, and the fuel supply is controlled by the switch means that are under control of the damper plate. This means that the combustion means cannot go into a combustion cycle unless and until the plate is open as aforesaid. This assures that no exhaust products are generated except for those produced by the pilot light unless they have a way of escaping out the flue.

It is important that combustion devices, especially those utilizing gas as a fuel, are always vented when in operation because the combustion products of such devices may include undesirable and poisonous substances such as carbon monoxide, unburned hydrocarbons and sulfur dioxide which in enclosed areas can cause asphyxiation and/or can explode. The subject damper means are preferably constructed of materials which are relatively resistant to rust and corrosion and can withstand widely varying temperature conditions without malfunctioning or breaking down. The subject control furthermore is constructed so that when it is in its open condition it presents no more obstruction or resistance to the flow of combustion products than does the duct or pipe in which it is positioned.

It is therefore a principal object of the present invention to minimize the loss of conditioned hot or cold air through an exhaust outlet.

Another object is to reduce the operating cost of furnaces, air conditioners, water heaters and other such combustion devices.

Another object is to provide automatic damper control means which substantially increase the efficiency and reduce the wear and tear on furnaces and other combustion devices.

Another object is to provide a damper control for furnaces and like devices which is extremely safe to use.

Another object is to minimize waste and/or reduce the fuel consumption of furnaces, space heaters, hot water heaters, air conditioners and like devices.

Another object is to provide automatic damper means which remain closed to prevent undesirable loss of heat during periods when no combustion is taking place.

Another object is to provide a relatively inexpensive automatic damper device which can be installed in new as well as existing furnace flues and the like.

Another object is to provide an automatic flue control device which must be in an open position before a combustion cycle can take place.

Another object is to provide automatic flue damper means which are relatively resistant to corrosion and can tolerate extremes in temperature including relatively high temperatures.

Another object is to provide damper means which are relatively quiet operating.

Another object is to provide damper means which require relatively little maintenance and repair.

Another object is to provide automatic damper means which include fail-safe electrical interlock means.

Another object is to minimize the chances of pilot light failures caused by downdrafts thereby enabling pilot lights to be operated at relatively lower levels of fuel consumption.

These and other objects and advantages of the present invention will become apparent after considering the following detailed specification which covers a preferred embodiment thereof in conjunction with the accompanying drawings, wherein:

FIG. 1 is a perspective view of automatic damper means constructed according to the present invention;

FIG. 2 is a cross-sectional elevational view taken on line 2–2 of FIG. 1;

FIG. 3 is a cross-sectional elevational view taken on line 3–3 of FIG. 1;

FIG. 4 is an enlarged fragmentary cross-sectional view taken on line 4–4 of FIG. 3, said view being slightly modified in construction;

FIG. 5 is a fragmentary cross-sectional view taken on line 5–5 of FIG. 4; and

FIG. 6 is a schematic circuit diagram of the present device including showing the connections to an associated furnace device.

Referring to the drawings more particularly by reference numbers, the number 10 in FIG. 1 refers to an automatic damper device constructed according to the present invention. The device 10 includes a flue assembly 12 for installing in a furnace or like flue 13 shown in dotted outline, and a control

assembly 14 connected thereto. A rotatable shaft 16 extends from the control assembly 14 through the flue assembly 12 and the portion of the shaft that extends through the flue assembly 12 has a damper plate 18 mounted thereon which moves with the shaft 16 between open and closed positions as will be explained. In the closed position, the damper plate 18 is in contact around most of its periphery with an annular ring or frame member 20 which is mounted within the flue assembly 12. The closed position of the damper plate 18 is shown in FIG. 2 in solid outline and the open position in dotted outline.

The flue assembly 12 is constructed to be mounted in the outlet flue of a furnace or like device and includes upper and lower flue sections 22 and 24, respectively which are shown as being round and tubular. The lower pipe section 24 includes a cylindrical lower portion 26 which is of a proper diameter to mate with the inside of one end of a standard section of flue pipe 13 shown in dashed outline in FIG. 1. The lower section 24 also has a large diameter cylindrical portion 28 which is connected to the portion 26 by a gradually tapered portion 30 therebetween. The larger diameter cylindrical portion 28 of the lower flue section 24 also has an outwardly extending annular abutment portion 32 formed therein near the center in position to abut the bottom edge of the upper flue section 22 to aid in aligning the two sections 22 and 24 during assembly thereof.

The upper flue section 22 is similar to the lower flue section 24 and includes a lower cylindrical portion 34 which cooperates with the cylindrical portion 28 as shown in FIGS. 2 and 3, a tapered portion 35 connected thereto, and a smaller diameter upper portion 36 which is properly sized and preferably also slightly tapered to be easily inserted into the end of an adjacent section of a flue pipe in which the subject device is installed in a well-known manner. The larger diameter portion 34 of upper flue section 22 is sized to be slightly larger in diameter than the portion 28 of lower section 24 with which it mates so that when assembled, the section 22 overlaps a portion of the section 24 down to the abutment portion 32.

The flue assembly 12 is formed to be larger in diameter in the center portion thereof than the diameter of the flue in which it is installed so that when the damper plate 18 is open the cross-sectional flow passages thereby is at least as large as the flow passage of the flue pipe 13. This is done so that when the damper 10 is open, it will not restrict the normal flow of exhaust products past the damper plate 18. The tapered portions 30 and 35 of the sections 22 and 24 are also gradually tapered as shown to minimize undesirable turbulence and back pressure that might otherwise occur.

The annular ring or frame member 20 is fixedly mounted within the flue assembly 12 in the area of overlapped end portions of the sections 22 and 24 and is attached to the sections by rivets 42 or similar means which are shown extending through the sections 22 and 24 and through the frame 20. In the preferred embodiment it is also desirable to include a layer of insulating material such as a layer of silicon rubber 44 to seal the space between the frame 20 and the adjacent pipe section 24 and to some extent to reduce or eliminate any noise which might be generated by metal-to-metal contact therebetween.

The shaft 16 on which the damper plate 18 is mounted extends across the space defined within the frame 20 and is rotatably journaled to the frame 20 by bearing means which are shown as including flanged sleeve bearing members 46 (FIGS. 3 and 5) which are constructed of a material such as Teflon. Flanges 47 of the sleeve bearings 46 extend from the frame 20 inwardly to adjacent to the damper plate 18 to position the damper plate centrally in the frame 20 and to minimize lateral movement thereof. Teflon and similar type bearing materials have extremely low coefficients of friction even without lubrication and also have excellent resistance to adverse environmental conditions such as are caused by temperature extremes and exposure to chemicals such as are present in the exhaust fumes of furnaces and like devices and therefore are particularly suited to this purpose. The other components of the flue pipe assembly 12 are also preferably constructed from materials which are relatively unaffected by the heat and the corrosive constituents of the combustion products. For example, in a preferred embodiment of the subject device 10, the flue sections 22 and 24 are fabricated from chrome and nickel plated heavy gauge steel while the shaft 16, damper plate 18 and the frame 20 are fabricated from aluminum or like materials.

The damper plate 18 is preferably substantially round and flat being somewhat smaller in diameter than the inside diameter of the flue section portion 28 so as to be free to move without rubbing or binding. The damper plate 18 is also larger in diameter than the inner diameter of the frame 20, and the damper plate 18 has a round channel 52 formed on a diameter thereof which channel cooperates with and receives the shaft 16. A strip of sound-deadening insulation 54 is positioned between the shaft 16 and the channel 52 to further deaden the sound of the damper plate when it moves. The damper plate 18 is fixedly connected to the shaft 16 by suitable fastener means such as nuts and bolts 56 which when drawn up tight compress the insulation layer 54 between the channel 52 and the shaft 16.

The frame 20 is constructed of two integral offset semicircular portions 62 and 64 (FIG. 2) having parallel surfaces 66 and 68 each engageable with approximately half of the periphery of the damper plate 18 when the device 10 is closed. When the plate 18 is in its normal closed position it engages somewhat compressible insulating overlayers 72 and 74 attached respectively to the opposite surfaces 66 and 68 on the frame member 20 to provide a relatively airtight connection therebetween. This combined engagement extends substantially all round the damper plate 18 and the frame 20 as shown. The compressible overlayers 72 and 74 are preferably construction from a material such as silicon rubber or a sponge material which is relatively unaffected by the heat and the chemicals normally contained in exhaust gases. The overlayers also help to prevent the damper from becoming frozen to the frame during periods of prolonged nonuse.

The frame 20 besides forming a seat on the damper plate 18 when in its closed condition, also serves to rigidly maintain the proper round cross-sectional shape of the flue pipes 22 and 24, thus assuring that a proper tolerance is maintained between the damper plate 18 and the flue sections at all times.

The damper plate 18 has arcuate peripheral cutouts 76 and 78 formed at opposite ends of the rounded channel portion 52 in which the shaft 16 is positioned. These cutouts provide clearance between the damper plate 18 and the portions 80 of the frame member 20 in which the bearings 46 for the shaft 16 are located. Portions of the cutouts 76 and 78 also form bearing surfaces adjacent to the flanges 47 which are part of the bearings 46 and help to maintain the damper plate 18 is a centered portion in the flue assembly 12. The cutouts 76 and 78 may also be slightly larger than necessary to provide some operating clearance and to allow controlled amounts of combustion products such as those generated by a pilot flame in the combustion device or amounts of raw or unburned gas such as might be present if the pilot flame went out to pass by the damper plate 18 even when it is in its closed position. An orifice 82 (FIG. 5) may also optionally be formed in the damper plate 18 for the same purposes.

The control assembly 14 is mounted on one side of the flue assembly 12 and is enclosed by a housing 88 which includes a bracket member 90 having spaced legs 92 which are fixedly attached to the flue sections 22 and 24 by rivets 94. The bracket 90 also has spaced upper and lower flanges 96 and 98 which extend outwardly away from the flue section 12 to form the upper and lower walls of the housing 88 for the control assembly 14. The rivets 94 in addition to attaching the bracket 90 to the flue sections 22 and 24 also help to attach the flue sections together. The rivets 94 are preferably of the closed end or solid type so that no gases can escape from the flue as-

sembly **12** therethrough. As can be seen in FIG. **5**, the construction of the bracket **90** is such that it supports the control assembly **14** in spaced relationship to the flue section **12** which is desirable since this spacing prevents the operating parts of the control assembly **14** from being directly exposed to the relatively high temperatures that may be present in the flue. This means that the control assembly will remain relatively cool even at times when hot gases are being exhausted. A layer of insulating material **100** can optionally also be placed between the flue assembly **12** and the legs **92** of the control assembly **14** to further reduce the amount of heat that will be transferred to the control assembly **14** from the flue pipe assembly **12** although normally this is not necessary.

The shaft **16** extends through the side of the flue assembly **12** and through the bracket **90** into the control assembly **14**. The end of the shaft **16** which extends into the control assembly **14** is preferably splined or flattened on one side as shown in FIG. **4**, and attached thereto is a member **102** which serves as a cam to operate associated switch means and as a crank as will be explained. One end of a connecting rod **103** is pivotally attached to a crank arm **104** on the member **102** which crank arm **104** is located to be eccentric relative to the shaft **16**, and the opposite end of the connecting rod **103** is pivotally connected to a movable armature or plunger **105** of a solenoid assembly **106** by means of a pin member **108**. The end of the rod **103** which is mounted on the crank arm **104** is retained thereon by suitable means such as by washer **110** and spring clip **112**.

The cam member **102** and the damper plate **18** are biased in a normally clockwise position as shown in FIG. **4** by means of a torsion spring **114** which is mounted around the shaft **16** in the space between the cam member **102** and the adjacent wall formed by the bracket **90**. One end of the torsion spring **114** is anchored to the cam member **102** by a stud **116** attached thereto and the opposite end of the spring **114** projects outwardly from the shaft **16** and is held in a desired tensioned condition by being restrained in a slot **117** formed in a bracket member **118** the position of which is adjustable by means of a threaded member **119** which extends through an elongated slot **120** in the member **118** and into a threaded hole **121** in the bracket member **90**. The position of the bracket member **118** can be changed as desired to provide the desired spring tension. The spring **114** should preferably be formed of a material such as stainless steel which retains its spring characteristics and also is resistant to deterioration and corrosion. The bracket member **118** can also be substituted for by a simple tab **122** (FIG. **3**) formed by a knockout in the bracket member **90**. The slot **117** in the adjustment member **118** or the tab **122**, if used, should preferably be such as to allow the restained end of the spring **114** to relatively easily move longitudinally therein to prevent the spring from binding during movement of the shaft **16** and to minimize radial stresses which otherwise might cause the spring **114** to characteristics. break or to lose its more or less linear operating characteristics

When the solenoid **106** is energized, the solenoid armature **105** and the pivotally attached connecting rod **103** are moved downwardly as shown in FIG. **4**. This in turn causes counterclockwise rotation of the cam member **102** and the shaft **16** and it also causes the damper plate **18** to move from its closed to its open position as shown in dashed outline in FIG. **2**. Thereafter, when the solenoid **106** is deenergized the armature **105** will move upwardly by the biasing action of the spring **114** and the damper plate **18** will also return to its closed position.

As can be seen in FIG. **4** when the cam **102** is rotated in a counterclockwise direction by energizing the solenoid **106**, it moves against a cam follower **123** located on the end of a switch arm **124** and in so doing depresses a switch actuator button **126** on a switch **128**, thereby closing the contacts of the switch. The switch **128** is a normally open switch preferably connected electrically in series with means such as the electric valve means which supply fuel to the furnace or other device with which the subject fuel control means are used. This means that no fuel can be supplied to the furnace until the damper plate **18** is open and the switch **128** is closed both of which conditions occur when the solenoid **106** is energized and rotates the cam member **102** as aforesaid. This is highly desirable since it means that no combustion can take place until the damper is open, and therefore there is no chance to trap the products of combustion in the furnace or force them out into the house or other building.

As can be seen in FIG. **1**, a cover **130** is provided for enclosing the control means **14** to protect the mechanisms contained therein and to improve the appearance. The cover **130** is preferably also constructed of a material that is resistant to corrosion. Ventilation holes **131** are formed at upper and lower locations in the sides **132** of the cover **130** to allow air to circulate therein and to maintain the controls in a relatively cool condition.

The circuit for the controls of the subject means is shown in FIG. **6**, in solid lines, and the wiring for the associated device being controlled such as for a furnace, water heater, air conditioner or the like is shown by dotted lines. When the subject device is installed on a gas furnace, power is fed to the device through a step down transformer such as transformer **133** which has a primary winding **134** connected to the source and a secondary **135** which is shown connected in series with a thermostat **136** suitably located and with a gas valve **137** which controls the flow of gas to the furnace.

The leads which otherwise would connect the gas valve **137** and the thermostat **136** in series across the power supply in a furnace are interrupted in the present device by also connecting in series therewith the normally open switch **128**. These connections are made at terminals **138***b* and **138***c* respectively on a terminal block **138** which is mounted inside the subject control assembly **14**.

The circuit also includes another electrical connection between a terminal **138***a* and one side of the secondary winding **135**, which terminal is also connected through other leads to one side of a silicon rectifier **140** and to one side of an indicator lamp **142**. The opposite side of the indicator lamp **142** is connected to the terminal **138***c* and then through the gas valve **137** to the opposite side of the transformer secondary **135**. This means that the indicator lamp **142** will be energized and shine through an indicator lens **144** in the cover **130** whenever the gas valve is energized.

The opposite input side of the rectifier **140** is connected to the terminal **138***b*, and the two output terminals of the rectifier **140** are connected to opposite sides of the solenoid **106**. This means that a DC solenoid instead of an AC solenoid can be used in the present device. This is desirable for several reasons including the fact that DC solenoids operate at substantially lower noise and vibration levels, they are more efficient, they have longer life expectancy, and they are better able to withstand higher temperature environments. Also in the preferred form of the present device the solenoid armature **105** is coated with a dry type lubricant to reduce friction, to even further increase the life expectancy thereof, and to prevent seizure or sticking particularly when the device is operated after prolonged shutdowns such as at the end of the warmer months when the furnace has not been operating.

In the normal operation of the device **10**, AC power is supplied to the primary **134** of the transformer **133**, and when the contacts of the thermostat **136** close indicating that the furnace should go into a combustion cycle, the solenoid **106** is energized. The circuit for energizing the solenoid **106** is from one side of the secondary windings **135** to and through the contacts of the thermostat **136**, to the terminal **138***b*, to one of the input connections of the rectifier **140**, from one of the rectifier output connections to one side of the solenoid **106**, through the solenoid coil and back to the other rectifier output connection and from there to the other rectifier input connection, and then to terminal **138***a* and to the opposite side of the secondary winding **135**. When the solenoid **106** is energized it opens the damper plate **18** and at the same time closes

the contacts of the switch **128** as aforesaid. As soon as the switch **128** closes, another circuit is established across the secondary winding **135** to energize the gas valve **137** allowing the burner of the associated device to be turned on. The closing of the switch **128** also energizes the lamp **142** to indicate that the device is operating. When the contacts of the thermostat **136** reopen because a desired temperature has been reached, the contacts of the thermostat **136** will deenergize the gas valve **137**, the lamp **142** and the solenoid **106** which allows the damper to reclose and in so doing opens the switch **128**. The damper plate **18** is returned to its normally closed position by the action of the spring **114**. With the damper plate **18** closed, the heat that has been produced in the furnace has no way to escape and therefore it will not be lost out the flue as is the case in conventional open flue furnaces and the like.

Inasmuch as the subject damper **10** is closed whenever the furnace or other associated combustion device is not in a combustion cycle, it acts to minimize escape of furnace heat as well as conditioned air in the surrounding room. The conditioned air may include warm room air in the winter time or cool conditioned air in the summer time. Also by being normally closed when the furnace or the like is not operating, the subject device **10** prevents downdrafts caused by gusty conditions and otherwise as well as updrafts caused by convection and vacuum in the flue **13**. Closing the exhaust flue **13** when the furnace is not in a combustion cycle also prevents downdrafts from blowing out the pilot light and may enable the pilot light to be operated on less fuel. In this way, use of the subject device results in a considerable savings in fuel costs in the winter, and in the summer reduces the cost of operating air-conditioning equipment including central air-conditioning equipment such as might be installed as part of a furnace or even separately installed.

Thus there has been shown and described a novel automatic damper device which fulfills all of the objects and advantages sought therefor. Many changes, modifications, variations and other uses and applications of the present device will, however, become apparent to those skilled in the art after considering this specification and accompanying drawings. All such changes, modifications, variations and other uses and applications which do not depart from the spirit and scope of the invention are deemed to be covered by the invention which is limited only by the claims which follow.

I claim:

1. Means for controlling the flow through an exhaust flue of a combustion device such as a furnace, air conditioner, water heater and the like comprising an open ended pipe adapted to be installed as part of the exhaust flue, a frame assembly mounted on the inside of the pipe, a layer of noise suppression material positioned between the frame assembly and the inside of the pipe, other noise suppression cushioning means attached to said frame assembly, a damper plate pivotally mounted in said frame assembly and movable between a closed position engaging the frame assembly including the said other noise suppression material substantially completely around the periphery thereof and an open position allowing substantially unrestricted communication through the pipe section, an operator member including a cam attached to and movable with the damper plate, DC solenoid motor means including a link member operatively connected offcenter to said cam and to said damper plate, means including a source of rectified alternating current and thermostatic control means for energizing the motor means as a condition to enable the combustion device to go into a combination cycle, said motor means operating to move said damper plate from its normally closed position to its open position, normally open switch means having switch actuator means engageable by the said cam, said switch actuator means being moved by said cam from a normally open to a switch closed condition whenever the damper plate is moved from its closed to its open position, the closed condition of said switch means establishing a circuit which enables the furnace or other associated device to go into a combustion cycle, and yieldable means urging the damper plate to its closed position and the solenoid motor means to its deenergized condition.

2. The means as defined in claim 1 wherein said other noise suppression cushioning means includes substantially semicircular shaped portions thereof attached to opposite surfaces on the frame assembly to engage the damper plate around the periphery thereof when the damper plate is in its closed position.

3. The means defined in claim 1 wherein said open ended flow pipe defines a larger cross-sectional flow area at the location where the frame assembly and the damper plate are located than at other locations therealong such that the cross-sectional flow area at the location of the damper plate when the damper plate is open is at least as large as the flow area cross section at other locations along the flow pipe.

4. The means defined in claim 3 wherein the flow pipe and the damper plate are both substantially round, the diameter of the damper plate being smaller than the diameter of the flow pipe at the location where the damper plate is positioned.

5. The means defined in claim 1 wherein said damper plate is attached to a shaft member pivotally mounted in the frame assembly, said cam being fixedly connected to said shaft member, which shaft member extends across the inside of the pipe substantially on a diameter thereof, said motor means including a solenoid having a movable armature operatively connected to the cam on the said shaft to cause rotation of the shaft when the solenoid is energized.

6. Means for controlling the discharge of the products of combustion from an exhaust flue of a combustion device such as a furnace, air conditioner, water heater or the like comprising an open ended tubular flue section adapted to be installed as part of an exhaust flue, a frame member formed by connected semicircular portions, said frame member being mounted to the inside of the flue section, a shaft member rotatable mounted in said frame in position to extend across the frame member and across the inside of the flue section, said shaft extending out through at least one side of the open ended tubular flue section, a damper plate fixedly mounted on said shaft and movable therewith between a closed position extending across the flue section and engaged around the periphery thereof with the frame member to substantially restrict communication through the flow section, and an open position angularly related to the closed position to provide communication through the flue section, means forming a cushioning layer between said shaft and said damper plate, means mounted outside of the flue section and operatively connected to said shaft for moving said shaft and the attached damper plate between its open and closed position, said shaft moving means including a cam attached to the shaft and solenoid motor means energizable in response to the occurrence of a predetermined condition which must occur before the furnace or other device can begin a combustion cycle, said solenoid motor means having an armature pivotally connected to the cam at a location spaced outwardly from the shaft, energization of said motor means operating to rotate the shaft and move the damper plate from its closed to its open position, and means including a spring mounted on the shaft between the cam and the flue section to restore the damper plate to its closed position when the motor means are deenergized.

7. The means defined in claim 6 wherein said frame member is formed by semicircular offset portions having surfaces positioned thereon to engage opposite sides of the damper plate, said surfaces on the frame member including resilient overlayers to sealably engage the damper plate around the periphery thereof when closed and to minimize noise produced when the damper plate moves to its closed position.

8. The means defined in claim 6 including switch means operatively connected with said cam and circuit means the position of said damper plate.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,580,238 Dated May 25, 1971

Inventor(s) Charles G. Diehl

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 1, line 34, "portion" should be "position".
Column 3, line 19, "large" should be "larger".
Column 4, line 41, "on" should be "for". Column 5, line 53, cancel "characteristics." and substitute "fatigue,".
Column 7, line 65, "combination" should be "combustion"
Column 8, line 70, cancel "the"; cancel line 71 and substitute "including an indicator controlled by said switch means to indicate the position of said damper plate."

Signed and sealed this 28th day of September 1971.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

ROBERT GOTTSCHALK
Acting Commissioner of Patents